

Advanced Stirling Power Generation System for CHP Application

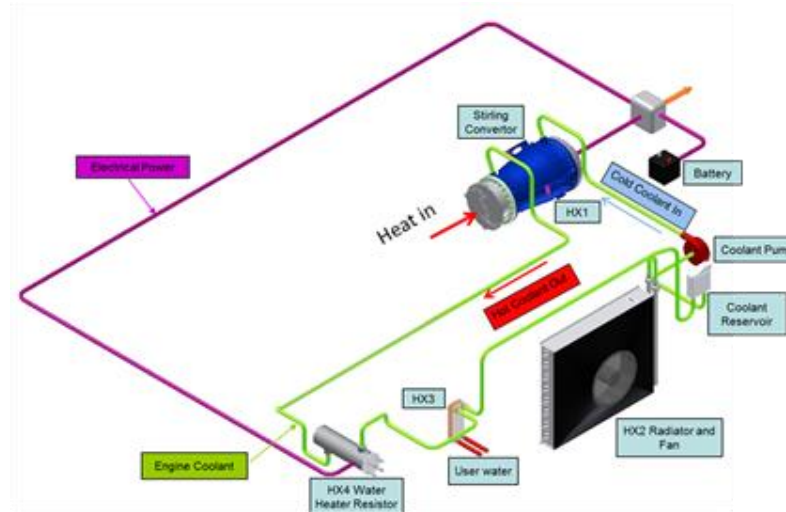
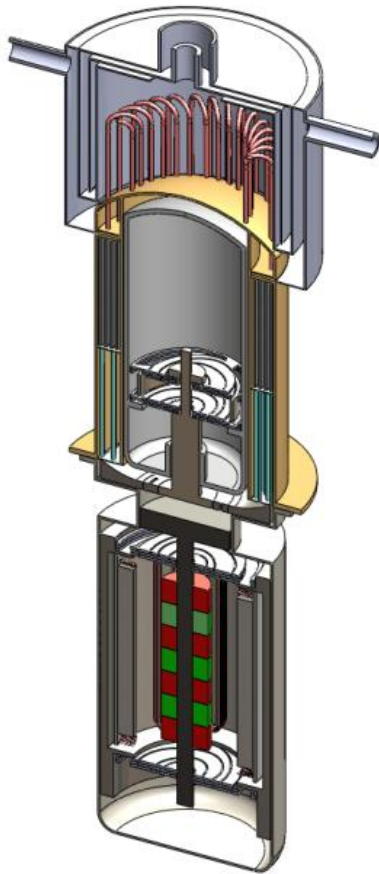
Temple University, Philadelphia, PA,
PI: Dr. Songgang Qiu

Project Team:

Temple: Dr. Songgang Qiu, Dr. Fei Ren, Post-Doctor, Graduate Students

Partners: Infinia Technology Corporation,
Qnergy, Gas Technology Institute

Free-piston Stirling Power Generation system for CHP



- *High efficiency, low cost CHP system*
- *Free-piston Stirling Power Generator*
- *Additively manufactured Stirling engine*
- *ITC/Qnergy linear alternator/converter*
- *GTI gas burner*

Free-piston Stirling Power Generation system for CHP

Technology Summary

<i>Efficiency (fuel to electricity)</i>	<i>> 38%</i>
<i>Electrical Power (AC)</i>	<i>1 kW</i>
<i>Heating</i>	<i>> 1 kW_{thermal}</i>
<i>System Life</i>	<i>> 10 years</i>
<i>Cost</i>	<i>< \$3,000</i>

Team of Proven Experts in the Respective Fields

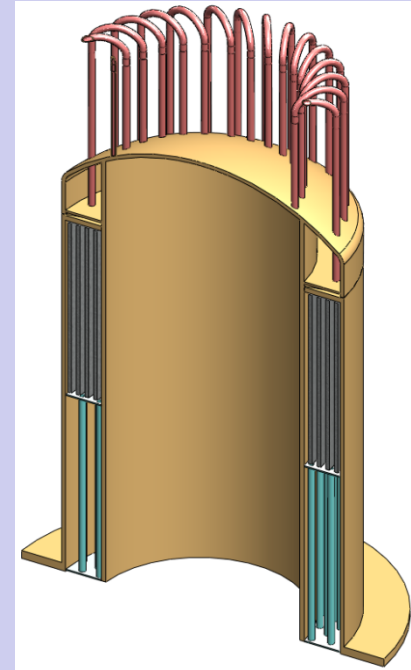
<i>Temple University:</i>	<i>Stirling Engine Design, Power Generators, CHP systems, Materials, System Testing</i>
<i>ITC/Qnergy:</i>	<i>Linear Alternator, DFMA, Low Cost Mass Production, System testing</i>
<i>GTI:</i>	<i>Gas Burner</i>
<i>Additive Manufacturer:</i>	<i>Additive Manufacturing of the Key Components</i>

High efficiency, low cost CHP system for home and business

Free-piston Stirling Power Generation system for CHP

Innovation and Uniqueness of the Temple Approach

- Innovative design of integrated pressure vessel, heat exchanger, and regenerator assembly
- Novel implementation of foil regenerator and heat exchangers
- Intelligent adaptation of additive manufacturing to the key components and critical assembly (heater head, regenerator, heat exchangers)
- Efficient and reliable regenerator



**Integrated one piece assembly
manufactured by additive
manufacturing methods**

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Schedule

Year 1: Complete preliminary design. Additively manufacturing and testing of key components.

Efficiency (heat to work) $> 47\%$

Electrical Power (AC) $> 1 \text{ kW}$

Heating $> 1 \text{ kW}_{thermal}$

Year 2: Fabricate and test a Laboratory Demonstration Unit. Temple University Stirling engine integrated with ITC/Qnergy alternator and GTI gas burner.

Year 3: Build and test a Prototype Unit to demonstrate

Efficiency (fuel to electricity efficiency) $> 38\%$

Electrical Power (AC) $> 1 \text{ kW}$

Heating $> 1 \text{ kW}_{thermal}$